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k, The Bladder; and

l, The umbilical Arteries, with the *Urachus* turn'd down, to ſhew

m, The *Uterus*, &c.

n, *n*, Is an Artery communicating with, and entering into, the *Aorta* of each, near the going off of the Emulgents.

o, The Heart of the ſmaller Child, much too large in proportion, together with the right Auricle.

p, Part of the Lungs, which were render'd much too ſmall, in proportion, by the Compreſſion of the large Heart upon them.

q, The *Aorta* and pulmonary Artery, as they are connected by the *Canalis Arterioſus* (*r*).

s, *t*, The deſcending Trunks of the Veins; the latter of which was preternatural, running round the left, and entering into the right Auricle in its poſterior Part.

The other Parts were much as thoſe of the former Child in general; except the *Aorta*, which was much ſmaller, as the Figure ſhews.

XI. *An Account of the Preparation and Uſes of the various Kinds of* Pot-aſh; *by* John Mitchell *M. D. & F. R. S.*

Read Nov. 17 *and* 24. 1748.

ALTHO' Pot-aſh is a thing daily uſed, and well known even to the Vulgar; yet, as the making it is a mechanic Art, practiſed only by the Vulgar, and neglected and overlooked by the Learned, ſo we have had

no ſatisfactory Account of it; and they, who underſtand it, generally keep it a Secret, leſt others ſhould learn ſo beneficial an Art. But as it is a Commodity that no Nation hardly can well be without, either for making Soap, Glaſs, Dying, or Bleaching, ſo the Way of making it is generally underſtood in moſt Countries, except our own. For in *France*, and other Countries where they make Wine, they make a kind of Pot-aſh in an eaſy manner from the Lees of their Wine. In thoſe and other more Southern Climes, they have many kinds of Herbs hereafter mention'd, either ſpontaneous, or cultivated on purpoſe, which they as eaſily convert into Pot-aſh. In *Germany*, and other more Northern Countries, they make great Quantities of Pot-aſh by extracting the Salts of their Wood-aſhes, in a manner that is well known. But it is only in *Ruſſia*, *Sweden*, and other Northern Nations, where the Art of converting their Wood-aſhes into Pot-aſh, without the tedious Proceſs of Elixiviation, is either well known to the Learned, or practiſed by the Vulgar.

By this means moſt Nations are ſupplied with this neceſſary Commodity of their own, except the *Engliſh*, who might be ſupplied with any Quantities of it, from the great Plenty of otherwiſe uſeleſs Wood they have in their Colonies, if not at home, if they knew how to make it. But it ſeems this Art is ſo little underſtood among us, that many Attempts I have known to make Pot-aſh have all proved unſucceſsful merely upon that account, ſo as to be intirely laid aſide. This has put me for ſome time upon inquiring into the Ways of making this

this Commodity, of which ſeveral have been ſuggeſted to me, from the ſeveral Trials and Informations hereafter mentioned.

It is well known, that the Aſhes of all kinds of Vegetables whatever afford Pot-aſh in ſome meaſure or other; altho' ſome are much more fit for that Purpoſe than others, which may be determined from the Experiments of *Redi* in the *Philoſoph. Tranſ.* N°. 243, p. 281. *Boerhaave*, *Merret*, and others; ſo that we need not inſiſt upon them here.

As for the Trees and Herbs of our Colonies in *North America*, moſt of thoſe that are common in their Woods are known to be fit for this Purpoſe, as the Aſhes of them all, burnt promiſcuouſly in their Houſes, make a very ſtrong Lye fit for Soap. Of theſe, the fitteſt for that Purpoſe is their *Hiccory*, the moſt common Tree in their Woods, which makes the pureſt and whiteſt Aſhes, of the ſharpeſt Taſte, and ſtrongeſt Lye, of any Wood I have ſeen. Their *Stickweed* is ſaid to do the ſame, which is as common a Weed. For this Reaſon the Aſhes of both theſe Plants were uſed by our *Indians* there, inſtead of Salt, before they learnt the Uſe of common Salt from the *Europeans*. The Aſhes of *Tobacco* likewiſe, when damnified, or not fit for a Market, or its Stalks, Stems, and Suckers, of which great Quantities are thrown away, and rot and periſh, are very fit for Pot-aſh, as they contain a great deal of Salts, and are well known to make a ſtrong Lye.

On the other hand, *Pines*, *Firs*, *Saſſafras*, *Liquid Amber*, or *Sweet Gum*, or all odoriferous Woods, and thoſe that abound with a Reſin or Gum,

Gum, are unfit for Pot-aſh, as their Aſhes are well known, even to our Planters, to make a very weak Lye, unfit for Soap.

Beſides theſe that contain little or no Salt, there are ſome other Vegetables that afford a large Quantity of it, but make a bad kind of Pot-aſh, at leaſt for many Purpoſes, on account of a neutral Salt with which they abound. This ſeems to have been the Caſe of the Pot-aſh made in *Africa*, in a Manufacture of that Commodity ſet up there by the *African* Company, which Mr. *Houſton* (who was chiefly concerned about it) tells us, in his *Travels*, proved ſo bad, on account of a neutral Salt it contained, that the Manufacture was left off on that account; or, perhaps, from their not knowing how to make it aright. What thoſe Vegetables are, that afford this kind of Aſh, is not well known, if it be not Fern, and ſome Sea-Plants.

Whatever Vegetables we make our Pot-aſh of ſhould be freſh or green, and no-ways rotten, dried, or decay'd. They ſhould likewiſe be burnt to Aſhes by a ſlow Fire, or in a cloſe Place; otherwiſe, when they are burnt in the open Air by a ſtrong Fire, great Quantity of the Aſhes is conſumed in Smoke, by the ſaline and terreſtrial Parts being carried up in Fumes, before they are ſeparated from theſe exhalable Parts by the Action of the Fire. For the Difference between burning Wood in a cloſe Place, or the open Air, is ſo great, that the Quantity of Aſhes obtained from one is more than double the other. This we learn from the Experiments of *Lundmarck* hereafter mention'd, who tells us, he burnt a Quantity of Birch in a cloſe

cloſe Stove, from which he obtained five Pounds of Aſhes; whereas the ſame Quantity of the ſame Wood burnt in the open Air, yielded only two Pounds.

It is for this Reaſon, that moſt People who make Pot-aſh, burn their Wood in Kilns, or Pits dug in the Ground; altho' the *Swedes* burn it in the open Air, as the Author above-mention'd informs us. This firſt Step, or the burning the Wood to Aſhes, ſeems to be taken by many for the whole Proceſs of making Pot-aſh; for they who pretend to have learned this Art in *Ruſſia*, as well as *Lemery* and ſome other Authors, hardly give us any other Account of it.

But, in order to convert the Aſhes, prepared in this or any other manner, to what is called Pot-aſh, there are many different Ways practiſed in different Countries, which make as many different kinds of Pot-aſh, that are all to be found in our Markets, and have all their reſpective Uſes.

1. The firſt of theſe is commonly called Pearl-aſhes by our People, who import great Quantities of it from *Germany*. This is no other than the lixivial Salt of Wood-aſhes, extracted by making a ſtrong Lye of them, and by evaporating it to Dryneſs, in a manner that is well known, and ſufficiently explained by *Kunkelius* in his Art of making Glaſs, *Boerhaave*, and many others; ſo that we need not inſiſt upon it here; we ſhall take a more fit Opportunity to explain it, for the Uſe of our People in *America*.

2. But the Art of converting theſe Wood-aſhes into Pot-aſh, without this tedious Proceſs of Elixiviation,

is only practiſed in *Ruſſia*, *Sweden*, and other Northern Countries, where it has been lately diſcloſed by one *Lundmarck*, who tells us he had often made it himſelf, in the manner he now deſcribes. This Account is contained in an academical Diſſertation upon this Subject at *Aboe* in *Sweden*, and was communicated to me by Dr. *Linneus*, Profeſſor of Botany at *Upſal*, as a genuine Account of this Art; which I think has hitherto been generally unknown.

This Author tells us, " They have many large " Woods of Beech in *Smoland*, and other Parts of " *Sweden*, in want of which they take Alder: Of " theſe they are allowed to uſe only the old and " decaying Trees for this Purpoſe, which they cut to " Pieces, and pile in a Heap, to burn them to Aſhes, " upon the Ground, by a ſlow Fire. They carefully " ſeparate theſe Aſhes from the Dirt or Coals in them, " which they call raking them; after which they col- " lect them in Baskets of Bark, to carry them to a Hut " built in the Woods for this Purpoſe. This they con- " tinue to do till they have a ſufficient Quantity of " theſe Aſhes. Then their whole Art follows; for " which they chooſe a convenient Place, and make " a Paſte of theſe Aſhes with Water, by a little at " a time, in the ſame manner, and with the ſame " Inſtruments, as Morter is commonly made of " Clay or Lime. When this is done, they lay a " Row of green Pine or Fir-Logs on the Ground, " which they plaſter over with this Paſte of Aſhes: " Over this they lay another Layer of the ſame ſtrait " Logs of Wood, tranſverſely or acroſs the others, " which they plaſter over with the Aſhes in the ſame " manner.

" manner: Thus they continue to erect a Pile of " theſe Logs of Wood, by Layer upon Layer, and " plaſtering each with their Paſte of Aſhes, till they " are all expended; when their Pile is often as " high as a Houſe. This Pile they ſet on fire with " dry Wood, and burn it as vehemently as they " can; increaſing the Fire from time to time, till " the Aſhes begin to be red-hot, and run in the " Fire. Then they overſet their Pile with Poles, " as quickly as they can; and while the Aſhes are " ſtill hot and melting, they beat and clap them, " with large round flexible Sticks made on pur- " poſe, ſo as to incruſt the Logs of Wood with the " Aſhes; by which the Aſhes concrete into a ſolid " Maſs as hard as Stone, providing the Operation has " been rightly performed. This Operation they " call *Walla*, i. e. *Dreſſing*. At laſt they ſcrape " off the Salt thus prepared, with iron Inſtruments, " and ſell it for Pot-aſh; which is of a bluiſh dark " Colour, not unlike the *Scoriæ* of Iron, with a " pure greeniſh white Salt appearing here and there " in it."

All the Pot-aſh we have from *Ruſſia*, *Sweden*, and *Dantzick* is exactly like what our Author here deſcribes, and ſeems to be made in this manner. It is, however, generally obſerved, that the *Ruſſian* is the beſt of theſe, on account of the greater Quantity of Salt in it. Now if, in the preceding Proceſs, we make our Paſte of the Aſhes with Lye, inſtead of Water, it is plain the Pot-aſh will be impregnated with more Salt, and make all the Difference there is between theſe Sorts of Pot-aſh. This then is likely to be the Practice in *Ruſſia*; where their

Wood may likewiſe be better for this Purpoſe, and afford more Salt. This is well known to be the Caſe of different Kinds of Wood: So our Author above-mentioned tells us, he obtained $2\frac{27}{64}$ ℔ of Salt out of eight cubic Ells of Poplar, which was very ſharp and cauſtic; but the ſame Quantity of *Birch* afforded only one Pound of Salt, and that not ſo ſtrong; and *Fir* hardly yielded any at all.

The Way of making Pot-aſh above-deſcribed may be the more eaſily underſtood by our People in *America*, for whom this is chiefly intended, as it is the ſame with their Way of making Lime of Shells, the only Lime they uſe in moſt Places. Theſe Shells they burn to Lime between the Layers of a Pile of Wood (inſtead of a Kiln) till it is reduced to Aſhes, in the ſame manner as is here directed to be done with Aſhes, to make Pot-aſh. The Lime, thus made, is reckoned very good; but, as it is impregnated with the Aſhes of the Wood, and the marine Salt that is often in the Shells, it is apt to make the Houſes that are built with it very damp in moiſt Weather; ſo that the Water often runs down their Walls in Streams; which cannot but be very unwholſome in an Air that is naturally cloſe and damp: The only Way to prevent which would be, to waſh and dry their Shells frequently, and burn them in dry Pine, that afford little or no lixivial Salt. But to return to our Purpoſe:

3. There is another Way of making Pot-aſh, practiſed chiefly in *England*, where they make it in the following manner, as I am informed by ſeveral, who have ſeen it done:

With

With their Aſhes of Fern, or Wood of any kind, they make a Lye, which they reduce to what they call Pot-aſh, by burning it with Straw. To do this, they place a Tub full of this Lye nigh a clean Hearth of a Chimney, in which they dip a Handful of looſe Straw, ſo as to take up a Quantity of Lye with it. The Straw thus impregnated with Lye they carry as quick as they can, to hold it over a blazing Fire on their Hearth, which conſumes their Straw to Aſhes, and at the ſame time evaporates the Water from the Salts of the Lye. Over the Blaze of the firſt Parcel of Straw they burn another dipt in Lye in the ſame manner. This they continue to do till their Lye is all expended. By this means the Coals and Aſhes of the Straw, and Salts of the Lye, are left on the Hearth, and concrete together into a hard ſolid Cake of a greyiſh black Colour, which they ſcrape off, and ſell for Pot-aſh.

This is an eaſy Way of making Pot-aſh, in want of proper Veſſels to extract the Salt of the Lye by Evaporation, or in want of Wood to reduce the Aſhes to Pot-aſh in the Way above-mentioned, for which it ſeems to be contrived, and for which it is only to be commended. For the Pot-aſh made in this manner is full of the Coal of the Straw, and its Salt is not ſo ſtrong, as our Workmen ſay, or ſo ſharp and corroſive as the Salt of the foreign Pot-aſh, that is calcined in an open Fire; beſides other Differences hereafter mentioned; which makes this Pot-aſh unfit for ſome Purpoſes, and not above half the Value of the foreign.

4. They have a very different Way in the North of *England* of reducing their *Kelp* to Pot-aſh, which they uſe for making Alum. This is made of the different Kinds of *Fuci*, or Sea-Weeds thrown up on the Shore, or gather'd on the Rocks; which they dry a little in the Sun, and afterwards burn them in a Kiln, built of the Stones they find on the Shore, in a cylindrical Form, and about two Foot or leſs in Diameter. In this they firſt burn a ſmall Parcel of the Herb, and before it is reduced to Aſhes they throw on more, till the Kiln is full, or their Materials are expended. This is ſaid to reduce the Aſhes to a hard and ſolid Cake, by the Heat of the Kiln, and Quantity of Salt in the Herb, which makes what is commonly called *Kelp-Aſhes*.

There are ſome other Ways of making Pot-aſh, ſuggeſted by ſeveral, both Authors and others, which appear to be more eaſy and ready than any of the above-mentioned; for which Reaſon they are apt to be tried by thoſe who make Attempts of this kind. Theſe are deduced from what they reckon the Nature and Properties of this Production: And there is no doubt, but if that was well underſtood, it might afford ſome Inſight in the Way of making it. For this Reaſon we made the following Experiments with the beſt *Ruſſia* Pot-aſh, in order to diſcover its Nature and Properties, and how they are moſt probably communicated to it; that we might ſee what we are to make; in order to imitate the beſt, or to make what is accounted good Pot-aſh.

1. *Ruſſia* Pot-aſh, as it is brought to us, is in large Lumps, as hard as a Stone, and black as a Coal,

Coal, incruſted over with a white Salt, that appears in ſeparate Spots here and there in it.

2. It has a ſtrong fetid ſulphureous Smell and Taſte, as well as a bitter and lixivial Taſte, which is rather more pungent than other common lixivial Salts.

3. A *Lixivium* of it is of a dark-green Colour, with a very fetid ſulphureous Smell, and bitter ſulphureous Taſte, ſomewhat like Gunpowder, as well as ſharp and pungent like a ſimple *Lixivium*.

4. Altho' it is as hard as a Stone, when kept in a cloſe Place, or in large Quantities together in a Hogſhead; yet, when laid in the open Air, it turns ſoft, and ſome Pieces of it run *per deliquium*; whilſt moſt other kinds of Pot-aſh only turn friable, and crumble in the open Air.

5. It readily diſſolves in warm Water, but leaves a large Sediment of a blackiſh grey Colour like Aſhes, which is in a fine ſoft Powder, without any Dirt or Coals in it, that are to be obſerved in moſt other kinds of Pot-aſh.

6. As it is diſſolving in Water, I have ſcummed off from ſome Lumps of it a dark-purple bituminous Subſtance, like *Petroleum* or Tar, which readily diſſolved in the *Lixivium*.

7. This, or any other true Pot-aſh, or a *Lixivium* made of them, will preſently tinge Silver of a dark-purple Colour, difficult to rub off; whilſt a mere lixivial Salt has no ſuch Effect.

8. Pieces of this Pot-aſh boiling in Water make a conſtant Exploſion like Gunpowder; which was ſo ſtrong as not only to throw the Water to ſome Height, but to lift up and almoſt overſet a ſtone Cup

in

in which I boiled them. Theſe Exploſions were owing not ſo much to the included Air, which ſome perhaps may imagine, as to the ſulphurous Parts of the Compoſition expanding and flying off: For this boiled *Lixivium* had neither the green Colour, nor fetid ſulphureous Smell and Taſte; at leaſt in any degree like what it has when made of the ſame Pot-aſh by a ſimple Infuſion in warm Water.

9. I evaporated ſome of the green *Lixivium*, made only by Infuſion, and filtred thro' a double Rag: As ſoon as it began to boil, a green Powder, to which its Colour is owing, fell to the Bottom, and the Lye became pale. After it was evaporated to a Pellicle, and ſet in a cool Place, a Salt ſeparated from it on the Sides of the Cup, in angular Cryſtals like Tartar. Theſe Cryſtals were ſoon formed, and in pretty large Quantities, but were difficult to ſeparate from the alkaline Lye and Salt, in which and the open Air they were apt to diſſolve: But from the Pellicle I obtained ſome Pieces of the ſame Salt that would not diſſolve in the open Air.

10. Oil of Vitriol makes a ſtrong Effervеſcence with this green Precipitate, with a white Fume, and a very ſtrong ſulphureous Smell. It does the ſame with theſe white Cryſtals, altho' the ſulphureous Smell is not ſo ſtrong. But with the pure fixed Alkali there was no ſuch ſulphureous Smell to be diſcerned.

From theſe Experiments we may determine ſomething about the Nature and Contents of Pot-aſh. This we are the better enabled to do, from the accurate

accurate Experiments and Reaſonings of the learned Mr. *Geoffroy*, on a like Subſtance made of Charcoal and an Alkali Salt calcined together, in which he obſerved all the Properties and Contents of Pot-aſh above mentioned, particularly related in the *Memoirs* of the *Royal Academy*, for the Year 1717. This was made of the ſame Materials, and had all the Properties above-related of our Pot-aſh; particularly a green *Lixivium*, a ſtrong ſulphureous Smell and Taſte, a ſulphureous green Precipitate, cryſtallized Salts, and ſulphureous Fumes with Oil of Vitriol. From hence this learned Author concludes, that this Subſtance contained the active ſulphureous Parts of the Wood, blended with more active igneous Particles. Theſe, united with the alkaline Salts, make a kind of Soap, or ſulphureous ſaponaceous Salt, reſembling Soap of Tartar, or *Hepar Sulphuris*. The cryſtallized Salts he attributes to the Acid of the Wood, mixing with the alkaline Salts. All theſe Parts of the Wood then are contained in our Pot-aſh; and he obſerved the ſame in the common *Soda*, or *Cineres clavellati*; altho' they are in a leſs Degree in that than in the *Ruſſian* Pot-aſh.

Beſides theſe, he ſhews that Pot-aſh contains a metallic Subſtance, which affords the *Pruſſian* Blue. We may add further, that the Combination of theſe Principles makes many Properties in Pot-aſh, more than what reſult from them in a State of Separation. The moſt remarkable of theſe ſeems to be its explo-ſive Quality; which we take to proceed from the cryſtallized Salts approaching to the Nature of Nitre, and uniting with the Sulphur and Charcoal; by which they form, from all theſe Ingredients of Gunpowder,

Gunpowder, a kind of that exploſive Subſtance, whoſe Parts are highly rarefied in an intenſe and confined Heat, by which they readily explode in boiling Lye.

By this we may perceive, that the Difficulty in making Pot-aſh aright, is, firſt, to reduce the Materials to Cinders and Aſhes, and at the ſame time to preſerve their volatile, ſulphureous, and exhalable acid Parts, that are totally deſtroyed in ſuch a Degree of Heat; and, ſecondly, to calcine theſe Aſhes ſtill further, ſo as to flux their Salts, and vitrify their terreſtrial Parts, and at the ſame time to keep them ſeparate from each other, or prevent their running into an indiſſolvable Glaſs. To give Pot-aſh ſome of theſe Properties, ſeems plainly to require a Degree of Heat that will totally deprive it of others.

The moſt likely Way by which it comes to receive all theſe Properties, is from the Way of making it in *Sweden* above deſcribed. In that Proceſs, the green Fir, in which the Aſhes are burnt, impregnates them with the acid ſaline Parts of the Wood or Tar, which is well known to be in pretty large Quantities, and is abſorbed and fixed by the alkaline Salts, and porous terreſttial Parts of the Aſhes in this Proceſs; ſo that, beſides the fixed alkaline Salts of the Aſhes, the Pot-aſh, thus made, muſt likewiſe contain the more volatile Salts of the Pine, which are exhaled in Smoke by burning the Pine alone in the open Air. Beſides theſe, it likewiſe contains the reſinous Parts and ſulphureous Fumes of the Pine, that are hindered from exhaling by the Heap of the Maſs.

At

At the ſame time the alkaline Salts are fluxed in the open Fire, and in a manner vitrified with the terreſtrial Parts of the Aſhes, which gives them their hard and ſolid Conſiſtence; whilſt the ſulphureous and acid Parts of the green Wood hinder them from turning to a perfect Glaſs, or inert *Calx*. All theſe Parts united together in the Fire, make that ſaponaceous Subſtance we find in the Pot-aſh thus made, which further hinders the Vitrification of the Maſs, and endows it with many of its moſt peculiar and active Properties.

From hence we may ſee how difficlut it is to make a Subſtance endowed with all theſe Properties in any other manner. This is the Reaſon why we could never before make Pot-aſh equal to that of *Ruſſia*, and the other Northern Countries, altho' we have much greater Plenty of Materials and perhaps better: For this Way of making it has never before been thought of by the Learned, or practiſed anywhere elſe, as far as I can learn.

Somewhat of the ſame Qualities are communicated to the *Engliſh* Pot-aſh, by the Way of making it above-deſcribed; but in a Degree as much inferior, as dry Straw, uſed for that Purpoſe, is to green Wood: Accordingly our Workmen find that Pot-aſh as much inferior to the foreign, for many Purpoſes.

From this Account of the Contents and Qualities of Pot-aſh, and the Way of making it, we may form ſome Judgment of the other Ways of making it, propoſed by Authors, and ſuggeſted by many. Thus *Lemery* and others tell us, Pot aſh is made in *Ruſſia*, and all the Northern Countries, only by

calcining the Aſhes in Pits brick'd within, and ſprinkling them well with Lye, till they become hard and ſolid. But ſuch a Calcination of Aſhes with a lixivial Salt, muſt render them whiter, inſtead of black, and muſt further deſtroy the active ſulphureous Parts of the Wood, which we find in Pot-aſh rightly made. So that this only leaves the Aſhes in the State they were at firſt, or turns them into a kind of indiſſolvable Glaſs, as we have found upon Trial.

This, and the like Miſtakes about the Way of making Pot-aſh, ſeem to proceed from a general Error concerning the Nature of it; for it is commonly ſuppoſed to be only a kind of inert *Calx*, impregnated with nothing but a lixivial Salt. Some ſuch Miſtake ſeems to have fruſtrated all the Attempts hitherto made of making Pot-aſh in *America*; for, upon Trial, what they have made there was found to be no better than common Aſhes.

But the moſt general Miſtake about the Way of making Pot-aſh, ſeems to proceed from the Accounts we have of making it, from Glaſswort, and ſome marine Plants, which are ſaid to be eaſily converted to this kind of Subſtance, in the manner abovementioned. But we apprehend, the Way of making it from Wood muſt be very different: For theſe Herbs are eaſily reduced to Aſhes by a ſmall Fire, that does not intirely conſume their ſulphureous Parts, which Wood is not. Theſe Aſhes abound with a great Quantity of alkaline and ſome neutral Salts, that readily convert them to a hard and ſolid Conſiſtence, which Wood does not. They have likewiſe few or no terreſtrial Parts, to run them into an indiſſolvable Glaſs, when fluxed in the Fire,

as

as happens in Wood-aſhes. Beſides, theſe Herbs have few or no ſulphureous or acid Parts, like moſt Woods; and the Pot-aſh made of them has few of theſe Principles in it, like what is made of Wood.

It is however generally ſaid, if we burn our Wood in a cloſe Place, as a Kiln in which we burn Lime, or make Charcoal, or a Pit dug in the Ground, we may impregnate the Aſhes with the ſulphureous Fumes and acid Parts of the Wood, only by the Cloſeneſs of the Place, or by ſmothering the Fire in it. If at the ſame time we impregnate them with a greater Quantity of lixivial Salt, it will flux the whole Maſs, and make it run into a ſolid hard Conſiſtence like Pot-aſh. This is commonly directed to be done, by throwing freſh or green Wood or Herbs upon the others, as they are burning, before they are quite reduced to Aſhes; or by ſmothering the Fire, as in making Charcoal; and at the ſame time to ſprinkle the Aſhes, thus burnt, with a ſtrong Lye from time to time, in the manner commonly practiſed with Glaſswort.

This would be a more ready Way of making Pot-aſh than any of the above-mentioned; but as thoſe who give their Advice about it, have neither tried it, nor ſeen it done; and thoſe who have tried this or any other Way, find more Difficulty in it, than they at firſt imagined, we ſhall ſuſpend our Judgment about it, till we ſee it fairly tried, leſt we ſhould deter ſome from making uſeful Experiments of it, or lead others into fruitleſs and expenſive Attempts.

By the various Ways of making Pot-aſh above-mentioned, and the different Materials it is made of, there appear to be many different Kinds of it,

that have as different Qualities. It would lead us too far beyond our preſent Deſign, to give a particular Account of each of theſe; but as they are uſed in many of our Manufactures, it ſeems worthy Inquiry, to know what Sorts are generally uſed, and what are the fitteſt to be uſed in them.

The Workmen in *England* make two general Kinds of it, which they diſtinguiſh by the Names of Pearl-aſh and Pot-aſh. The firſt is a mere lixivial Salt, which is ſuppoſed to be the only Ingredient of any Efficacy in Pot-aſh; but, upon Trial, there is found to be a great Difference between them, eſpecially in making Soap. The Salt is ſo weak in the Pearl-aſh, that it does not intirely diſſolve and unite with the Fat. The Reaſon ſeems to be, that theſe Salts are diſſolved in Water, in order to extract them, by which they loſe many of their cauſtic igneous Parts; whereas in Pot-aſh, the Salts are calcined and fluxed in an open Fire, with the ignited terreſtrial Parts of the Aſhes, which makes them more ſharp and corroſive: They are likewiſe incorporated with the Coal, and fuliginous Parts of the Vegetables they are made of, or with the reſinous Parts of Fir, which gives them the ſulphureous Quality above-mentioned, and makes a kind of *Soap* of *Tartar*, or *Hepar Sulphuris*, in all Pot-aſh; which makes theſe Salts ſo ready to diſſolve, and incorporate with Oil, or other pinguious Subſtances.

This is perhaps the Reaſon, why the *Cineres Ruſſici* are ordered for this Purpoſe, inſtead of a mere lixivial Salt, by the *College* of *Phyſicians* in their late Diſpenſatory. The Soap made of them muſt be impregnated with their heating ſulphureous Quality,

Quality, which will make it more aperient and detergent, but not ſo mild and ſoft as ſome others; by which it may be more fit for obſtinate and indurated Obſtructions, but will be more offenſive to the Stomach; which is much complained of by ſome People, who take large Quantities of the ſharper Kinds of Soap.

But, to conſider Pot-aſh as a Commodity in Trade and Manufactures, which is its chief Uſe; it appears, that the People in *England* not only have it at a dear Rate, but the worſt Sorts of it, at leaſt for moſt Purpoſes; which cannot but have a proportional Influence on their Manufactures: For it is generally of as great, and ſome Sorts of a greater Value in their Markets, than a pure lixivial Salt; notwithſtanding the ſmall Quantity of ſuch Salt in Aſhes, and the Trouble and Expence of extracting it; which ſeems to be occaſioned by their not knowing how to convert Aſhes into this Commodity; for in *Sweden*, where this Art is known, *Lundmarck* tells us, Pot-aſh is ſold for little more than a Farthing a Pound, which coſts our Workmen nigh Six-pence.

But this is not the only Inconvenience we labour under for want of this Commodity; the Sorts we are chiefly ſupplied with are perhaps the worſt of any, and unfit for many Purpoſes for which Pot-aſh is uſed. The only Pot-aſh almoſt to be met with here, comes from *Ruſſia*, *Sweden*, and *Dantzick*, or is made in *England*. Theſe are all made either of Wood or Fern-aſhes, whoſe Salts are never ſo pure and white at the beſt, as ſome others: But, by the Way of making them, and the Experiments on them above-mentioned, they

they appear to be impregnated with Coal, Smoak, and Soot, which renders them ſtill more foul and impure, makes them of a black, brown, or green Colour, and of a peculiar ſulphureous Quality. On this account they are intirely unfit for making white Glaſs: They make a very coarſe and ſtrong kind of Soap; they are too foul, ſharp, and corroſive for bleaching, and are as unfit for dyeing, at leaſt many Colours.

It is perhaps for this Reaſon, that the Workmen here, as they ſhewed me themſelves, make all their white Glaſs with Salt-petre; which muſt not only be more coſtly, but *Neri*, *Merrett*, and others, tell us it is not ſo good, at leaſt for the better Sorts of Glaſs, as a ſharper lixivial Salt. What they uſe for dyeing I am not ſo well appriſed of: It is ſaid, they uſe the volatile Alkali of Urine; but the *French* Pot-aſh, made of the Lees of Wine, is generally allow'd to be the beſt for that Purpoſe. So likewiſe the *Alicant* Pot-aſh is reckoned much the beſt for bleaching, and making of Soap; as the *Syrian* and *Egyptian* is for making Glaſs.

Theſe purer Kinds of Pot-aſh are all made of Herbs, that grow only in the more Southern Climates, whoſe Salts are finer and whiter, and leſs acrid and corroſive than the Salts of Wood, or moſt other Vegetables; and by the Way of extracting them by Calcination in a more open Fire, they are more free of Coal, Smoak and Soot, or any other hererogeneous Mixture. On this account they are much better for the Purpoſes above-mention'd, than the coarſe and foul Kinds of Pot-aſh that our People are ſupplied with.

All

All we have of theſe Kinds of Pot-aſh, it ſeems, comes only from *Spain*; for which Reaſon our People were obliged to petition to allow the Importation of Pot-aſh from thence, during the late War; as appears by an Order of the King and Council of the 24th of *June* 1742. ſince they could not do without it in many Manufactures: So that it may be worth our Inquiry, to know what it is that produces ſo neceſſary a Commodity.

This Kind of Pot-aſh is commonly called *Barrilha*, from an Herb of the ſame Name in *Spain* that produces it. The firſt Account we have of this *Barrilha* is from *Amatus Luſitanus*, who leaves us much in the dark about it. It is generally ſaid in *England* to be a Plant pretty well known to the Botaniſts by the Name of *Ficoides Neapolitana, flore candido. Hort. Lugd. Bat.* but for what Reaſon I cannot ſay. We have as little Reaſon to believe with *John Bauhine* that it is what he calls *Kali vulgare:* For Mr. *de Juſſieu* has ſhewn us, that the true *Barrilha* is a different Plant from any of theſe, from his own Obſervations of it in *Spain*, where it was cultivated; of which he has given us a particular Account, by the Name of *Kali Hiſpanicum, ſupinum, annuum, Sedi foliis brevibus. Mem. Academ. Anno* 1717. *p.* 93. or *Alicant Glaſs-wort.*

The Pot-aſh made of this Plant, he tells us, makes the beſt Soap, the fineſt Glaſs, and is the beſt for bleaching of any other; for which Reaſon it is much ſought after in all Countries, where they value themſelves for theſe Manufactures. But I queſtion very much, whether our Workmen have it either pure and

and genuine, or in ſufficient Quantities for theſe Purpoſes. All the Uſe I find made of it among them, is to make hard Soap; altho' they ſay what they have of it ſpoils their ſoft Soap, by making it curdle. This is well known to be the Effects of Sea-Salt; and Mr. *de Juſſieu* and others tell us, that the true *Barrilha* is often adulterated with Sea-weeds, which contain ſuch a marine Salt; ſo that it is probably only this adulterated Sort that they have. Accordingly, all the *Barrilha* I have found here, was of a dark-brown Colour, and very foul and ponderous; whereas the true Sort is ſaid, by all who know it, to be more porous, pure, and of a bluiſh Colour. It is for this Reaſon in all Probability, that, notwithſtanding all the *Barrilha* our Workmen have at ſo dear a Rate from *Spain*, yet they can never make ſo good Soap, as what comes from thence, and ſome other Places.

The only Way then, by which we are likely to have this Commodity either pure and genuine, or in ſufficient Quantities at a reaſonable Rate, is from the Herb itſelf that produces it. Whether or not it would grow in *England* is not known, as I believe it has never been tried: But there is no doubt but it would grow very well in our Colonies in *America*, as I am certainly informed it does in the *Spaniſh* Colonies there, where they have great Plenty of it; and a Sort that is indigenous, particularly in *Peru*, which might probably be found in our Colonies, if ſought for by thoſe who knew it. But wherever it will grow in any of the *Engliſh* Dominions, there is no doubt but it would be a conſiderable Improvement, where Pot-aſh of all kinds is ſo valuable a Commodity,

Commodity, and ſo much wanted; for it grows on the ſame Ground with Corn of any kind, which it does no Harm to, as it is a ſmall annual Herb, that does not ſpread till the Corn is ripe, or off of the Ground.

There are ſome other Plants that are known to make a kind of Pot-aſh, commonly called *Rochetta*, which is ſaid to be even preferable to the *Barrilha*, eſpecially for making Glaſs. Theſe are the firſt and ſecond Kinds of *Kali*, deſcribed by *Proſper Alpinus*, in his Account of the Plants of *Egypt*. The firſt of which is the above-mention'd *Ficoides* that grows in *Italy*, and all over the *Levant*, but the other is peculiar to *Egypt*. Theſe would be fit Improvements for our Colonies in *America*, where we ſeem to want nothing more than ſome proper Production for the vaſt Tracts of Land we are poſſeſſed of there. But theſe Plants alone afford a Commodity, which *Pr. Alpinus* and *Rauwolfius* tell us they ſaw many large Ships yearly loaded with in *Egypt*, and which gives the Excellency to the Glaſs and Soap that are made at *Venice*.

It would be worth while then at leaſt to make a Trial of a Production, that is likely to improve both our Trade abroad, and our Manufactures at home. It was this that put me upon the preſent Inquiry, as an Improvement fit for our Colonies, which if I find acceptable, I ſhall hereafter conſider ſome others.